

3 HABITAT AND SPECIES DESCRIPTIONS

3.1 GEOLOGY, SOILS, TOPOGRAPHY, AND CLIMATE

3.1.1 GEOLOGY

Much of the following geologic information is drawn or summarized from the Sierra Valley Watershed Assessment (SVRCD 2005).

INTRODUCTION

The California Division of Mines and Geology subdivides California into 12 geologic provinces. A unique combination of geology, topographic relief, and climate distinguishes each province. The Sierra Valley watershed lies within the northern Sierra Nevada geologic province, a continuous mountain range spanning 400 miles extending in a north-northwest direction. The Sierra Nevada province is bordered to the north by the Lake Almanor/Honey Lake area and to the west by the Great Valley province.

The geologic setting of the Antelope Valley Wildlife Area (AVWA) and Smithneck Creek Wildlife Area (SCWA) derives from their location on the volcanic flows of the Sierra Valley watershed. Sierra Valley contains unique topographic features that are attributed partly to being one of the most geologically faulted regions in California, and carved by at least four stages of the Ice Age (DWR 1963, cited in SVRCD 2005). The valley lies among a series of northwest trending bands of volcanic ridges and peaks. Granitic rocks to the west and younger rocks to the east of the depositional Hallelujah Formation bound the valley.

DESCRIPTION

In general, the Sierra Valley watershed consists largely of more recent pyroclastic eruptions and volcanic flows, which lie upon the metavolcanic and granitic basement rock. Locally, rocks of the Sierra Valley can be divided into three general groups: Jurassic and Cretaceous metavolcanic and granitic rocks, Tertiary volcanics, and Quaternary sedimentary deposits. These general rock types are described in more detail below, and rock types specific to the wildlife areas are shown in Exhibit 3.1-1.

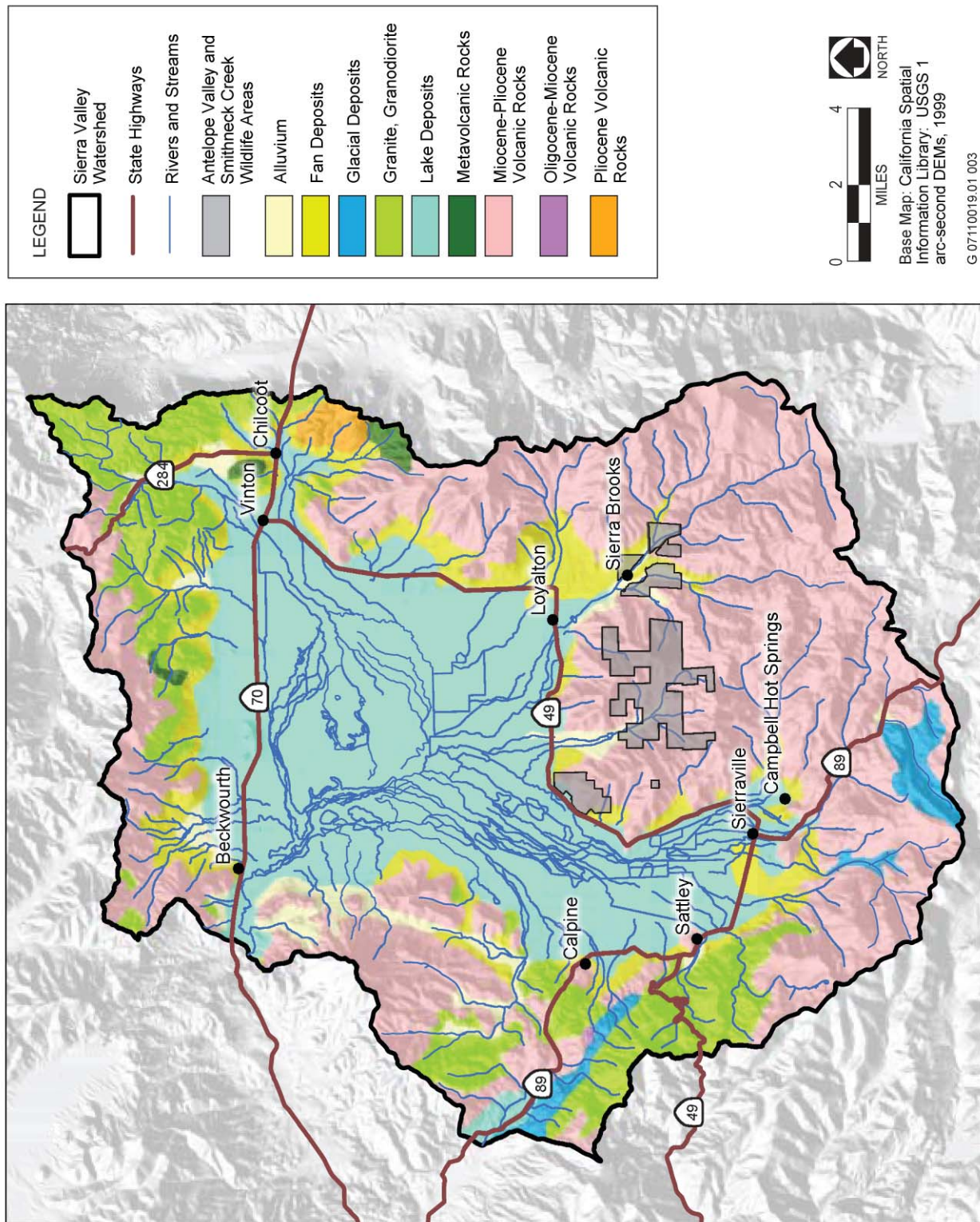
Jurassic and Cretaceous Metavolcanic and Granitic Basement

Jurassic (150–205 million years ago [Ma]) and Cretaceous (70–150 Ma) rocks form the basement complex and consist largely of metamorphic rocks, plutonic granites, and granodiorites. These impermeable basement rocks are visible in the northeastern portion of the Sierra Valley watershed surrounding Little Last Chance Creek and in the southwestern portion of the watershed forming the western margin of the Mohawk Valley Fault. They are also thought to underlie the more recent Tertiary volcanic material of the Dixie Mountain and Loyalton Volcanoes, discussed below.

The metavolcanic and metasedimentary rocks of the region are thought to represent remnants of a Jurassic island arc system (Grose 2000a, cited in SVRCD 2005), which are accreted to the North American Continent and subsequently intruded by plutons of quartz diorite and granite. The rocks are generally massive and crystalline and form rounded outcrops intruded by granitic pegmatite dikes (DWR 1983, cited in SVRCD 2005).

Tertiary Volcanic

Much younger volcanic deposits, which rest upon the Mesozoic basement rocks that began to develop nearly 10 Ma (Grose 2000b, cited in SVRCD 2005), are present throughout the watershed. They consist largely of silicic tuffs and andesitic and dacitic flows and tuffs that rest on the older metavolcanic and granitic basement rocks. Examples of volcanic rocks can be found along the valley foothills, or appear as isolated buttes and low hills in



Source: SVRCD 2005

Geology of Sierra Valley

Exhibit 3.1-1

the valley and in prominent areas such as the Antelope Valley volcanic center south of Loyalton, Loyalton volcanic center east of Loyalton, and the Sardine Peak complex located approximately 9 miles due south of the Loyalton volcanic center.

Volcanic material of the Sierra Valley can be generally divided into four groups: (1) late Oligocene to early Miocene silicic tuffs, (2) mid-Miocene andesitic flows and tuffs derived from local sources, (3) mid-Miocene dacitic to andesitic flows, and (4) tuffs from the Antelope Valley volcanic center (Grose 2000c, cited in SVRCD 2005).

Quaternary Sediments

Sediments that make up the gently sloping foothills and valley floor are derived from a variety of sources including inflowing streams, deposits from the Sierra Valley Lake, glacial till, and volcanic eruptions. Volcanic deposits include volcanic fanglomerates, conglomerated sandstones and mudstones, tuff and tuff breccias, mudflow breccias, and ignimbrite series (Durrell 1966, cited in SVRCD 2005). These sediments were likely deposited in a lenticular fashion coarsening radially outward near the margins of the valley.

FAULTING

The Sierra Valley lies among one of the most geologically faulted regions in California. Three primary faults Grizzly Valley Fault, Hot Springs Fault, and Mohawk Valley Fault, trend northwest and are suspected to dissect the watershed.

Grizzly Valley Fault

Grizzly Valley Fault can be traced from Mapes Canyon north of Beckwourth, extending along Smithneck Creek until it goes to Sardine Valley. The fault zone is approximately 10 miles long and 1–2 miles wide. Movement along the fault zone consists of left lateral high-angle normal faults of which a small right-slip component of movement is suspected (Grose 2000b, cited in SVRCD 2005).

Hot Springs Fault

Hot Springs Fault parallels Grizzly Valley Fault and can be traced southwest from Beckwourth to where it intersects the Grizzly Valley Fault approximately 1 mile north of Sardine Valley. This fault's name refers to the hot spring well and other thermal artesian wells located along this trace.

Mohawk Valley Fault

Mohawk Valley Fault trends northwest and is located throughout the Mohawk and Sierra Valleys southeast through Sierraville. The fault is a high-angle normal fault with occurrences of dextral-divergent movement. Vertical offset is estimated to be from 1,640 to 3,870 feet (Sawyer 1995, cited in SVRCD 2005).

It is suspected that many of the normal faults have fractured the underlying basement rocks resulting in substantial variations in the depths of valley sediments. Some estimates are from 800 feet below ground surface (bgs) up to 2,000 feet bgs (DWR 1963, cited in SVRCD 2005).

3.1.2 SOILS

Primary soils data available for the Antelope Valley and Smithneck Creek Wildlife Areas include:

- ▶ Soil Survey of the Sierra Valley Area, California, Parts of Sierra, Plumas, and Lassen Counties (NRCS 2007a)
- ▶ Soil Survey of the Tahoe National Forest (NRCS 2007b)

A brief description of common soil series present throughout the watershed is included below (NRCS 2007c). A summary of the soil types present within the wildlife areas is included in Table 3.1-1, Exhibit 3.1-2a, and Exhibit 3.1-2b. Soils within AVWA and SCWA consist of volcanic loams that are moderately deep and somewhat excessively drained. Small isolated rock outcroppings of metamorphic origin can be noted across portions of AVWA and SCWA. With these exceptions, soils are moderately deep and productive (CAL FIRE 1996).

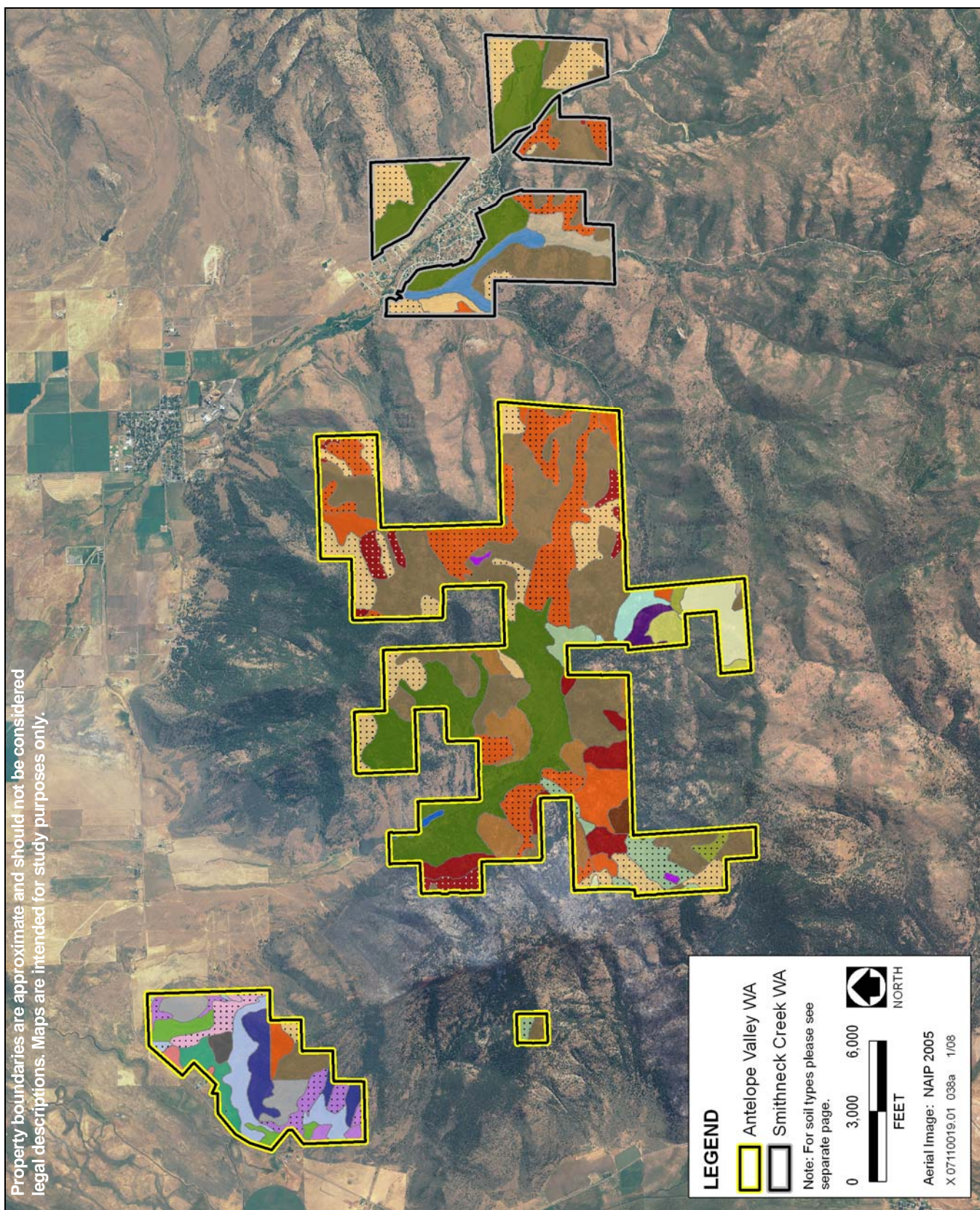
Table 3.1-1 Soil Types within Antelope Valley and Smithneck Creek Wildlife Areas	
Acidic Rock Land	Aldax-Millich complex, 30–75% slopes
Aldax-Millich complex, 5–30% slopes	Aldax-Aquolls-Kyburz complex, 2–9% slopes
Aldi-Kyburz complex, 2–30% slopes	Aldi-Kyburz-Rock Outcrop complex, 30–75% slopes
Aquolls and Borolls, 0–5% slopes	Badenaugh very cobbly sandy loam, 2–30% slopes
Badenaugh-Martineck-Dotta association, 2–30% slopes	Balman-Ramelli complex, 0–2% slopes
Coolbrith silt loam, 0–2% slopes	Correco sandy loam, 2–5% slopes
Correco sandy loam, 5–15% slopes	Dotta cobbly sandy loam, 2–30% slopes
Dotta sandy loam, 2–9% slopes	Franktown-Aldi-Rock Outcrop complex, 2–30% slopes
Franktown-Aldi-Rock Outcrop complex, 30–50% slopes	Fugawee sandy loam, 2–30% slopes
Fugawee sandy loam, 30–50% slopes	Fugawee variant-Fugawee complex, 2–30% slopes
Fugawee variant-Fugawee-Rock Outcrop complex, 30–75% slopes	Fugawee-Tahoma complex, 30–50% slopes
Kyburz-Aldi complex, 2–30% slopes	Kyburz-Aldi complex, 30–50% slopes
Kyburz-Rock Outcrop-Trojan complex, 2–30% slopes	Kyburz-Trojan complex, 30–50% slopes
Kyburz-Trojan complex, 9–30% slope	Mariposa-Jocal complex, 2–30% slopes
Ramelli clay	Riverwash
Rock Outcrop, volcanic	Rock Outcrop-Franktown-Kyburz complex, 50–75% slopes
Trojan stony sandy loam, 30–50% slopes	Trojan-Sattley-Cryumbrepts, wet complex, 2–30% slopes
Trojan-Sattley-Kyburz complex, 2–30% slopes	Trojan-Sattley-Kyburz complex, 30–50% slopes
Source: NRCS 2007a and NRCS 2007b	

ALDAX SERIES

The Aldax series consists of shallow, well-drained soils that formed from material weathered from andesite or basalt. These soils are loamy-skeletal, mixed, superactive, mesic Lithic Haploxerolls. The Aldax soils are on uplands with slopes of 4 to 75%, and elevations ranging from 5,000 to 8,000 feet. The climate is semiarid with warm, dry summers and moist, cold winters. The mean annual precipitation is 12 to 18 inches and the mean annual air temperature is about 47°F. Permeability is moderately rapid in the Aldax soil. Runoff is medium to rapid. The Aldax series supports big sagebrush, bitterbrush, bluegrass, cheatgrass, squirreltail, and rabbitbrush with scattered pinyon pine and juniper.

ALDI SERIES

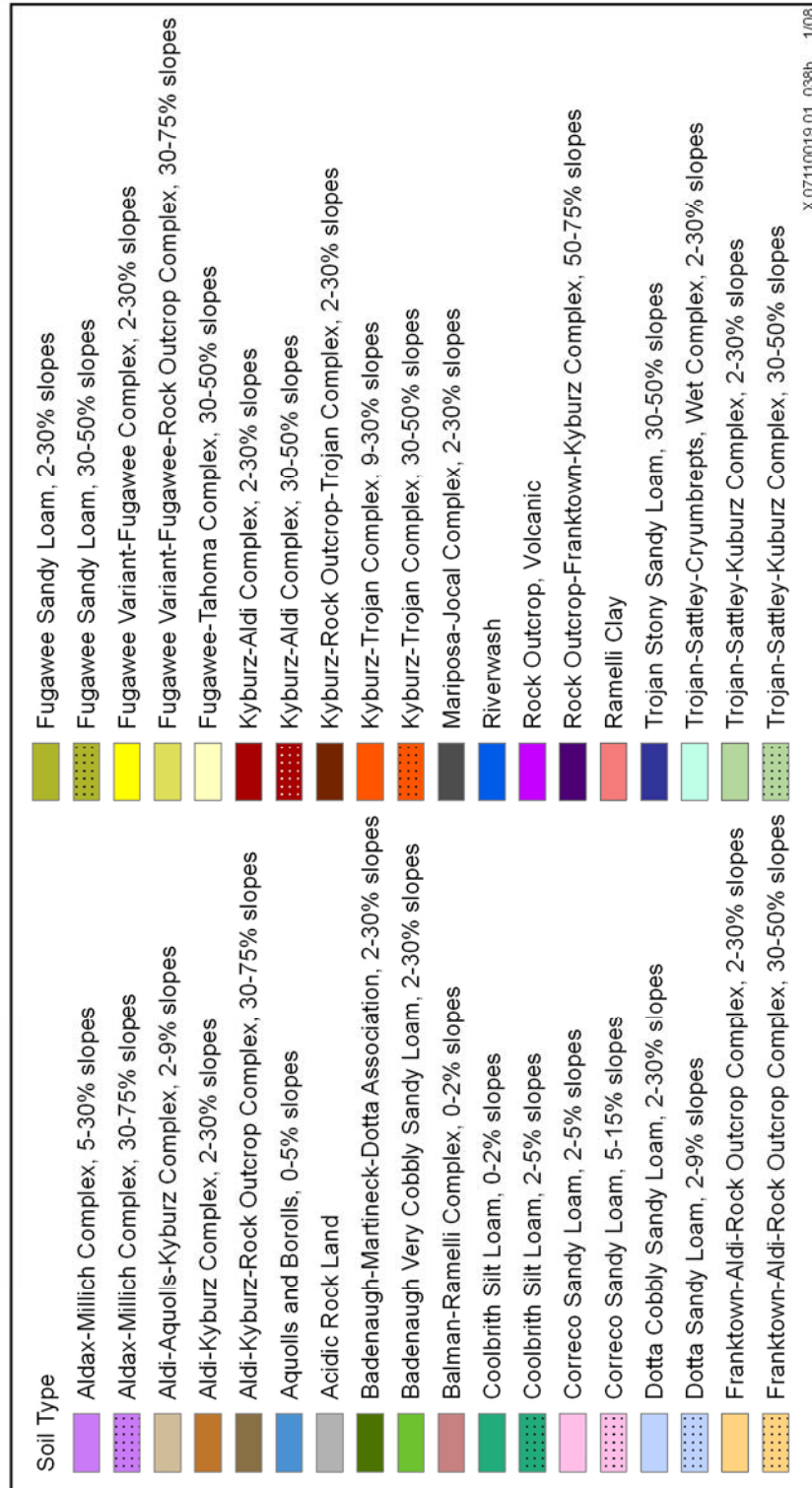
The Aldi series consists of shallow, well-drained soils formed in material weathered from volcano rock. These soils are clayey, smectitic, frigid Lithic Ultic Argixerolls. Aldi soils are on gently sloping valley floors and moderately steep to



Source: NRCS 2007a, NRCS 2007b

Soils Within the Antelope Valley and Smithneck Creek Wildlife Areas

Exhibit 3.1-2a



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Source: NRCS 2007a, NRCS 2007b

Soils Legend

Exhibit 3.1-2b

steep mountainside slopes at elevations of 5,000 to 6,500 feet. Slope ranges from 2 to 75%. The mean annual precipitation varies from 15 to 35 inches and the mean annual temperature varies from 43 to 47°F. Permeability is slow and runoff is medium. Principal species are bitterbrush, sagebrush, annual and perennial grasses.

AQUOLLS

Mollisols that are saturated with water for long periods eventually have limited use for most crops, other than for pasture, unless they are artificially drained. Aquolls (a suborder in the U.S. system of soil taxonomy) may have a histic epipedon, a sodium saturation in the upper part of the mollic epipedon, of >15% that decreases with depth or mottles or turns gray within or immediately below the mollic epipedon.

BADENAUGH SERIES

The Badenaugh series are loamy-skeletal, mixed, superactive, mesic Aridic Argixerolls. The series consists of very deep, well-drained soils that form in alluvium derived from mixed igneous rocks. Badenaugh soils are on fan remnants and stream terraces. Slopes are 2 to 30% and elevation ranges from 4,000 to 6,000 feet. The climate is semiarid with cool, moist winters and warm, dry summers. The mean annual precipitation is 10 to 16 inches and the mean annual temperature is 46 to 50°F. Permeability is moderate or moderately slow with medium or high surface runoff. The vegetation is mainly mountain big sagebrush, antelope bitterbrush, Indian ricegrass, Thurber's needlegrass, and scattered western juniper.

BASIC ROCK LAND

The Basic Rock Land consists of rough, rocky terrain. Rock outcrops and very shallow soils cover as much as 50 to 90% of the surface. These rocks are primarily found in the foothills and steep mountainous terrain. The rock consists primarily of volcanics. The vegetation is spotty cover of sagebrush, annual and perennial grasses, and minor stands of timber.

BOROLLS

Borolls are cold climate mollisols. They formed in areas with annual soil temperature less than 46°F, and a long wet season (i.e., never dry for 60 consecutive days or more within the 90 days following the summer solstice). They do not contain material with a calcium carbonate equivalent greater than 400 grams per kilogram (unless they have a calcic horizon) and their use for most crops is not limited by the period of soil saturation.

DOTTA SERIES

The Dotta series consists of very deep, well-drained soils that formed from alluvium weathered from metamorphic and igneous rock sources. They are on alluvial fans and terraces. Dotta soils are fine-loamy, mixed, superactive, mesic Pachic Argixerolls. Slopes are 0 to 30% and elevation ranges are 2,000 to 5,500 feet. The mean annual precipitation is 12 to 25 inches and mean annual temperature is 47 to 52°F. Runoff is rapid to slow and permeability is moderate to moderately slow. Vegetation is Idaho fescue, bluebunch wheatgrass, bearless wheatgrass, and big sagebrush.

FRANKTOWN SERIES

The Franktown series consists of very shallow and shallow, somewhat excessively drained soils that formed in residuum and colluvium derived from metamorphic rocks. Franktown soils are loamy-skeletal, mixed, superactive, frigid Lithic Ultic Haploxerolls. This soil occurs on mountains and typically occurs on backslope positions. Elevations range from 5,200 to 8,000 feet at slopes of 45 to 80%. Mean annual precipitation is 16 to 30 inches and mean annual temperature is 41 to 45°F. Franktown soils have very high surface runoff and moderately rapid permeability. The vegetation is principally Jeffery pine in small groves or as scattered trees with

an understory of mountain big sagebrush, antelope bitterbrush, serviceberry, snowberry, bluegrass, needlegrass, buckwheat, and curleaf mountain mahogany.

KYBURZ SERIES

The Kyburz series consists of moderately deep, well-drained soils formed in material weathered from basic volcanic rock. Soils are fine-loamy, mixed, active, frigid Ultic Haploxeralfs. Kyburz soils are on gently sloping plateaus and moderately steep to steep mountain slopes at elevations of 5,500 to 6,400 feet. Slopes range from 2 to 50%. The mean annual precipitation is 18 to 35 inches and the mean annual temperature is 43 to 47°F. Soils have slow to rapid runoff and moderate to moderately slow permeability. Principal species are Jeffery pine and ponderosa pine.

MARTINECK SERIES

The Martineck series is a member of the clayey-skeletal, smectitic, mesic, shallow family of Aridic Duixerolls. These soils are gently sloping to moderately steep and are on undulating to hilly terraces at elevations of 4,500 to 5,200 feet. The mean annual precipitation is 12 to 18 inches and mean annual temperature is 48°F. Martineck soils have slow to rapid runoff and very slow permeability. The vegetation is low sagebrush, bitterbrush, and perennial grasses.

MILLICH SERIES

The Millich series consists of shallow, well-drained soils that formed in residuum and colluvium derived from volcanic rocks. Soils are clayey, smectitic, frigid Lithic Argixerolls. Millich soils are on hills with slopes 5 to 60% and elevations from 5,400 to 6,500 feet. The mean annual precipitation is 12 to 18 inches and the mean annual temperature is 45 to 49°F. Surface runoff is very high and permeability is slow. The vegetation is antelope bitterbrush, low sagebrush, mountain big sagebrush, needlegrass, bottlebrush squirreltail, singleleaf pinyon, and widely spaced Jeffery pine.

TROJAN SERIES

The Trojan series consists of deep and very deep, well-drained soils that formed in colluvium and residuum derived from volcanic rocks or from schist and argillite. Soils are fine-loamy, isotic, frigid Ultic Argixerolls. Trojan soils are on hills and mountains. Slopes are 2 to 50% and elevation ranges from 4,900 to 6,500 feet. The mean annual precipitation is 16 to 28 inches and the mean annual temperature is 39 to 47°F. Trojan soils have moderately slow permeability and medium or high surface runoff. The vegetation is an open forest canopy of Jeffery pine and ponderosa pine with an understory of antelope bitterbrush, curleaf mountain mahogany, mountain big sagebrush, and scattered western juniper.

EROSION HAZARDS

Four parameters—soil, slope, cover, and climate—are considered when evaluating erosion hazards. Soil must be analyzed for detachability and permeability. Slope must be viewed for uniformity and steepness. Cover is important because of the density of both living and dead vegetation that shields the soil from erosion by raindrops. Climate is important in determining erosion hazards. The distribution of annual precipitation, intensity of storms, distribution of snowfall and snowmelt, and the freezing of the ground surface affect erosion. Together these parameters provide a general sense of the potential for soils to erode. Soils are designated as a “slight,” “moderate,” or “high” erosion hazard.

Environmental conditions in both AVWA and SCWA make these ecosystems susceptible to erosion, as evidenced by the incised conditions of Antelope Valley Creek and Bear Valley Creek (see Appendix D). In addition, both wildlife areas have experienced surface soil erosion problems during storm events following large fires. After the Harding fire (see Chapter 3.6 Fire and Timber Harvest), which burned much of the vegetative cover protecting surface soils on steep slopes in AVWA, a large storm event quickly released several inches of rain onto these

exposed slopes. Large amounts of sediment and debris were washed down these slopes into channels and tributaries in Antelope Valley below.

3.1.3 TOPOGRAPHY

AVWA and SCWA lie on the southeast edge of the Sierra Valley watershed. The topography of the Sierra Valley watershed is typical of former lake basins. A large portion of the watershed's 297,000 acres is part of the valley floor. The low gradient of the valley floor is a result of the Pleistocene lake that once occupied the valley. During this time, an abundance of glaciers could be found throughout the Sierra Nevada. Traces of these glaciers are found within the watershed today. The steep slopes of the surrounding Sierra Nevada still drain into the Sierra Valley, but now become the headwaters of the Middle Fork Feather River. The topography is moderately steep, 30–70%, with incised canyons exceeding 75% (CAL FIRE 1996).

ELEVATION

Elevation within AVWA ranges from 5,000 feet at the valley floor to 6,800 feet in the surrounding mountains. The SCWA elevation ranges from 5,200 to 6,000 feet (Department 1990). Loyalton sits at 4,985 above mean sea level (msl). The U.S. Geological Survey (USGS) 7.5-foot quadrangle maps within the wildlife areas are Antelope Valley, Sierraville, Loyalton, and Sardine Peak. Watershed topography with elevation bands is shown in Exhibit 3.1-3.

3.1.4 CLIMATE

Climate data is based primarily on information provided in the Sierra Valley Watershed Assessment (SVRCD 2005).

TEMPERATURE AND GROWING SEASONS

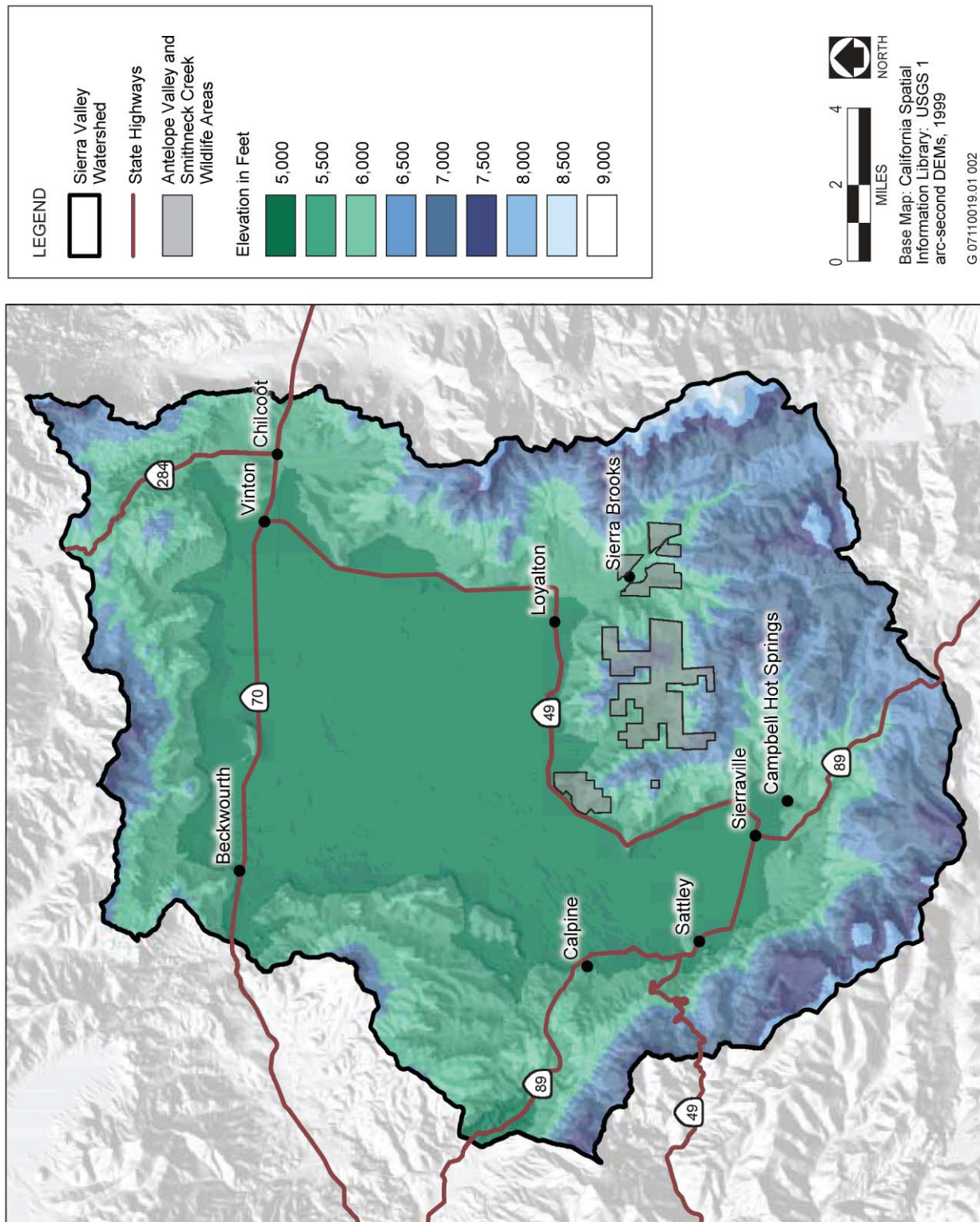
Average annual temperatures within the Sierra Valley watershed range from a low of approximately 30°F to a high of 63°F. Temperatures are typically warm in the summer months with average maximum monthly temperatures occurring in July at approximately 84°F in Sierraville. Temperatures ranging from the high 70°Fs to the mid-80°Fs are common from June through September. Maximum temperatures have been recorded in August at 104°F in Sierraville.

Temperatures in winter months average 30°F in Sierraville. Maximum temperatures from December through February range from the low to mid-40°Fs throughout the watershed. The lowest recorded temperature in Sierraville was -29°F on December 9, 1972.

The first fall freeze generally occurs in September in Sierraville and on the rest of the valley floor. May is generally the last month of freezing temperatures. At higher elevations in the watershed, it is not uncommon to experience freezing temperatures throughout the year.

During January, Sierraville experiences daily temperature fluctuations of approximately 30°F. In July, temperatures fluctuate nearly 40°F.

Evaporation is the amount of water lost from a system. The sun's radiation, air temperature, wind speed, and vapor pressure (relative humidity) cause evaporation. Evaporation data, although typically used to schedule irrigation events, closely reflect the evaporation rates of surface water and are used to help calculate water balance of the watershed. Data (DWR 1979, cited in SVRCD 2005) indicate the average evaporation rates from 1960 to 1970 for the area around Vinton (approximately 10 miles north of the wildlife areas) (see Table 3.1-2). Although these are the only evaporation data available for the watershed it is assumed that the evaporation rates would be similar for the rest of the valley floor.



Source: SVRCD 2005

Sierra Valley Elevations

Exhibit 3.1-3

Table 3.1-2 Evaporation Rates (Inches) for Vinton: 1960–1970													
Year	Total	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1960					44	49	106	228	215	266	267	283	206
1961		127	80	57				171	208	282	331	239	209
1962		141						180	166	203	225	247	206
1963		108	22					81	130	163	283	263	164
1964		117	35					137	169	187	257	259	212
1965		154							165	178	198	198	164
1966		134							208	232	279	252	188
1967		138								128	214	177	133
1968		98							225	289	349	243	223
1969									245	201	307	317	226
1970										214	321	321	
Mean	1,716	127	46	57	44	49	106	159	192	213	276	254	193
Source: DWR 1979, cited in SVRCD 2005													

The growing season, based on freezing dates, is approximately 60–90 days on the valley floor. The growing season typically shortens considerably in the mountainous regions to the west and south of the valley.

PRECIPITATION

On average, most areas of the Sierra Valley watershed receive approximately 15 to 20 inches of precipitation per year. Most precipitation falls during the winter months with 77% of the annual total falling between November and March. Monthly averages are highest in January with 4.59 inches falling in Sierraville and 4.17 inches falling in Portola. Rainfall during the summer months is limited to thundershowers 5 to 10 days per year, accounting for less than 5% of the annual precipitation. Precipitation not only feeds the creeks and rivers of the region, but recharges the groundwater resource as well.

Average total precipitation recorded at the USFS Sierraville Ranger Station between 1997 and 2007 are shown in Table 3.1-3. The Sierraville Ranger Station data were collected at an elevation of 4,975 feet in the Feather River basin.

SNOWFALL

Snowfall data collected at the Sierraville Ranger Station (elevation 4,975 feet above msl) show January as having the highest average snowfall at approximately 17.9 inches with average annual snowfall of approximately 71.8 inches. The highest total annual snowfall recorded at the Sierraville Ranger Station was 242.3 inches in 1952.

In this high elevation valley, snow tends to stay on the ground for long periods. In January, the average snow depth in Sierraville is 5 to 6 inches, with snow depths consistently above 2 inches from December to April.

Table 3.1-3
Average Total Precipitation (Inches) for the Sierraville Ranger Station: 1997–2007

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
1997	12.21	0.45	0.40	0.61	0.06	1.32	0.00	0.00	0.36	1.62	2.25	1.80	21.08
1998	5.38	7.09	3.88	1.67	1.81	0.31	0.08	0.00	2.35	0.73	4.38	2.37	30.05
1999	5.99	8.87	2.64	1.88	0.00	0.12	0.00	0.82	0.37	1.75	1.58	0.74	24.76
2000	8.90	7.00	0.48	1.79	0.63	0.41	0.00	0.00	0.21	1.84	1.00	0.74	23.00
2001	0.88	1.88	1.82	1.91	0.00	0.00 ^a	0.02	0.00	0.42	0.6	4.62	4.68	16.83
2002	1.60	1.18	2.37	0.98	0.38	0.05	0.11	0.00	0.00	0.00	6.10	7.19	19.96
2003	1.13	1.12	2.43	3.99	0.55	0.18	0.51	1.28	0.01	0.03	1.45	6.76	19.44
2004	1.63	6.45	1.13	0.08	0.69	0.25	0.00	0.01	0.31	2.91	2.54	2.69	18.69
2005	3.88	1.31	4.82	1.40	2.16	0.59	0.00	0.00	1.39	0.43	1.64	17.84	35.46
2006	3.92	4.72	4.18	6.25	0.31	0.18	0.00	0.00	0.00	0.15	1.59	1.86	23.16
2007	0.81	5.22	0.76	0.89	0.33	0.32	0.00	0.00	0.08	1.63	0.39	–	10.43 ^b

Notes:

^a Trace of Precipitation

^b Excluding December

Source: DWR 2007.